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AUTHOR Amoriell, William J.
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ABSTRACT

Several researchers have attempted to measure sequencing and integration in the decoding process in an effort to isolate some independent variables that may contribute to reading retardation, but most have measured the ability of children to manipulate nonverbal material. It is unclear whether nonverbal tests measure the same processes involved in beginning reading. In light of this, three perceptual tests more closely related to beginning reading were developed: visual sequential memory for letters, auditory sequential memory for phonemes, and visual-auditory integration. Ninety-seven third grade students were grouped according to below average reading ability, and average or above average ability and given the three perceptual tests. The disabled readers scored significantly lower than the average or above average readers on the measure of visual sequential memory for letters. The disabled readers had sufficient attention and perceptual ability to successfully cope with tasks involving auditory sequential memory and visual-auditory integration. Primary teachers and reading specialists may need to consider implementing a program involving visual sequential memory for letters, as the inability of many disabled readers to cope with these tasks may be preventing them from acquiring the sight vocabulary needed for reading ability development. (HTH)

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Visual Sequential Memory and Reading Disabilities

William J. Amoriell, Ed.D.
Loyola College

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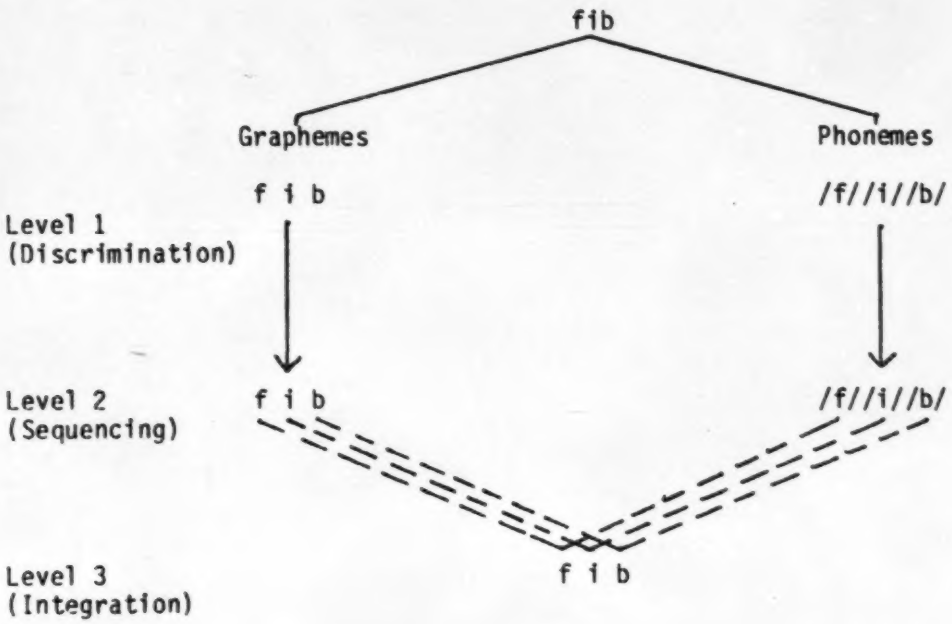
Runninghead: Visual Sequential Memory

There has been a major effort by educators and school systems to develop assessment and instructional strategies to meet the diverse needs of children with reading disabilities. In spite of this, reading diagnosis and remediation often remain uncertain. Further research is needed to identify deficits that may contribute to failure in beginning reading.

During the beginning reading stage, readers must become proficient at decoding. They must be able to discriminate, sequence and integrate visual and auditory stimuli in order to progress in reading maturity. This process is diagrammed in figure 1.



Level 1 - Discrimination of graphemes and phonemes.
Level 2 - Sequencing of graphemes and phonemes.
Level 3 - Integration of visual (graphemes) and auditory (phonemes) sequences.

Figure 1. Decoding Process in Word Recognition

Any disruption in the decoding process may cause reading failure.

Several researchers have attempted to measure levels two (sequencing) and three (integration) of the decoding process in an effort to isolate some independent variables which may contribute to reading retardation. (Reilly, 1971; Beran, 1970; Goodnow, 1971; Jones, 1970; Richie, 1976; Badian, 1977; Amoriell, 1979). Most researchers have measured the ability of children to manipulate non-verbal material; such as, sequencing a series of dots and dashes (visual-spatial and/or auditory temporal). For example, a subject would listen to a morse code-type pattern (e.g., / . - . /) and then have to match it with one of two or three alternative visual sequences (e.g., . . -; - . -; . - .).

However, it is unclear whether non-verbal tests measure the same processes involved in beginning reading. In light of this, it was decided to develop and research three perceptual tests that might relate more closely to the beginning reading process: i.e., 1. visual, sequential memory for letters (level 2), 2. auditory, sequential memory for phonemes (level 2), 3. and visual-auditory integration (level 3).

Two of the tests used in this study measured the ability to process sequential stimuli within the visual or auditory modality. The visual, intrasensory test measured visual, sequential memory for letters. The child was flashed a set of letters for a duration of one second per letter in the series. The task involved matching the flashed sequence with one of three possible alternatives on a response sheet. The auditory, intrasensory test presented the child with two sets of phonemes, via a tape recorder. The task was to determine if the two sets were the same or different.

The third test was a measure of visual-auditory integration. The subjects were flashed a series of animal pictures at a rate of one second per animal in the series, immediately followed by a series of animal sounds. The task was to determine, if the set of animal sounds exactly matched the animal pictures

flashed on a wall screen. The animal figures were drawn in black on a white background. (see Figure 2)

Figure 2. Sample of Animal Figures Used During Integration Test

METHOD

This study is a replication of an earlier one (Amoriell, 1979). Ninety-seven third graders were identified for this study in accordance with the following criteria:

Group 1	Group 2
1. No visual or auditory acuity problem.	1. No visual or auditory acuity problem.
2. No visual or auditory discrimination deficit	2. No visual or auditory discrimination deficit.
3. Average range of mental ability.	3. Average range of mental ability
4. Average or above in reading ability as measured by an informal reading inventory.	4. Significantly below average in reading ability as measured by an informal reading inventory.

It was important to control for visual and auditory acuity and discrimination, as these are prerequisite to the sequencing and integration abilities measured in this study. (see Figure 1)

All children were administered the three perceptual tests designed by this writer: 1. visual, sequential memory for letters; 2. auditory, sequential memory for phonemes; 3. and visual-auditory integration. The three perceptual tests were administered in the morning and required approximately forty minutes to complete.

RESULTS

Analysis of variance was used to test the null hypothesis-- There will be no significant difference in the performance of disabled and average or above average readers on the three perceptual measures. According to the results, the disabled readers scored significantly poorer than the average or above average readers on the measure of visual, sequential memory for letters ($p < .001$) (Table 1). The disabled readers had sufficient attention and perceptual ability to successfully cope with tasks involving auditory, sequential memory and visual-auditory integration.

Table 1

Differences Between the 59 Average and 38 Retarded Readers on the Revised, Perceptual-Test Variables

Variable	Source	DF	SS	MS	F
Visual-Visual	"Between" Groups	1	102.26	102.26	18.42*
	"Within" Groups	95	572.905	5.5	
Auditory-Auditory	"Between" Groups	1	.26	.26	.0002
	"Within" Groups	95	105671.19	1112.32	
Visual-Auditory	"Between" Groups	1	498.7	498.7	.926
	"Within" Groups	95	51122.78	538.1	

*Significant at the .001 level

Educational Implications

Primary teachers, as well as reading specialists, may need to consider implementing a program involving visual, sequential memory for letters. Evidence is accumulating to substantiate the inability of many disabled readers to cope with tasks involving visual, sequential memory for letter (Spirling 1970; Venezky 1974; Amoriell 1979). Perhaps this deficiency is preventing some children from acquiring the sight vocabulary necessary in the development of reading ability. Additional replications of this study are needed, however, to further validate this deficit.

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